CLAIMS

1. A method operative for mirroring a selected data object from at least one local storage device (SDL) into at least one remote storage device (SDRx), the at least one local storage device being coupled to a first processing facility (HL), and the at least one remote storage device being coupled to a second processing facility (HR), and where the at least one local storage device, the at least one remote storage device, the first and the second processing facility are coupled to a network connectivity comprising pluralities of users, of processing facilities and of storage devices, the method comprising the steps of:

running a mirroring functionality in the first and in the second processing facility, the mirroring functionality comprising:

a freeze procedure for freezing the selected data object,

a copy procedure for copying the frozen selected data object into the at least one remote storage device,

permitting use and updating of the selected data object in parallel to running the mirroring functionality, and

commanding, by default, repeated run of the mirroring functionality for copying updates to the selected data object, unless receiving command for mirroring break, whereby the selected data object residing in the at least one local storage device is copied and sequentially updated into the at least one remote storage device.

2. The method according to Claim 1, wherein the mirroring functionality further comprises:

applying the freeze procedure for freezing the selected data object as a source volume (SV),

creating at least one local auxiliary volume (AVL) to which updates addressed to the selected data object are redirected, each single data object out of the selected data object corresponding to one local auxiliary volume out of the at least one local auxiliary volume,

creating at least one remote volume in each remote storage device out of the at least one remote storage device, to correspond to each one local auxiliary volume created,

forming in the at least one local storage device, of at least one resulting source volume comprising the frozen selected data object and the at least one local auxiliary volume, and

applying the copy procedure for copying the frozen selected data object from the at least one resulting volume into the at least one remote storage device.

3. The method according to Claim 1, further comprising:

applying the mirroring functionality simultaneously to more than one data object.

4. The method according to any one of claims 1, 2 or 3, further comprising:

mirroring simultaneously from at least one local storage device to at least one remote storage device, and *vice-versa*.

5. The method according to Claim 2, wherein the mirroring functionality further comprises:

applying the freeze procedure for freezing simultaneously more than one data object.

6. The method according to Claim 2, wherein the mirroring functionality further comprises:

applying the copy procedure to copy simultaneously more than one frozen selected data object.

7. The method according to Claim 1 or 2, further comprising:

mirroring simultaneously one single data object residing in one local storage device into more than one remote storage device.

8. The method according to Claim 1 or 2, further comprising:

mirroring simultaneously more than one single data object from one local storage device into one remote storage device.

9. The method according to Claim 1 or 2, further comprising:

mirroring simultaneously a plurality of single data objects residing respectively in a same plurality of local storage devices into one remote storage device.

10. The method according to Claim 1 or 2, further comprising:

mirroring simultaneously a plurality of single data objects residing in one local storage device respectively into a same plurality of remote storage devices.

11. The method according to Claim 1 or 2, further comprising:

mirroring simultaneously one single data object residing in each one local storage device out of a plurality of local storage devices into one remote storage device.

12. The method according to Claim 1, wherein mirroring further comprises:

at a selected point in time:

starting a mirroring cycle,

freezing the selected data object,

creating at least one local auxiliary volume (AVL) in the at least one local storage device (SDL) and at least one remote volume (RV) in the at least one remote storage device (SDRx),

forming at least one resulting source volume comprising the frozen selected data object and the local auxiliary volume (AVL), and

after the selected point in time:

copying the frozen selected data object from the resulting source volume into the at least one local auxiliary volume until completion of copy,

redirecting to the local auxiliary volume of the updates addressed to the selected data object,

permitting use of the selected data object during mirroring, by associative operation with the resulting source volume, and

repeating a next mirroring cycle by default command, after completion of copy to the at least one remote storage device, unless receiving command for mirroring break.

13. The method according to Claim 12, wherein mirroring further comprises:

starting a next mirroring cycle at a next point in time occurring after completion of copy to the at least one remote storage device,

freezing the resulting source volume,

creating an ultimate local auxiliary volume in the local storage device and an ultimate remote volume in the at least one remote storage device,

forming an ultimate resulting source volume comprising the penultimate resulting source volume and the ultimate local auxiliary volume , and

after the next point in time:

copying the penultimate local auxiliary volume into the ultimate remote volume, and,

redirecting to the ultimate local auxiliary volume of the updates addressed to the selected data object,

permitting use of the selected data object during mirroring, by associative operation with the ultimate resulting source volume, and

after completion of copy into the ultimate remote volume:

synchronizing the penultimate local auxiliary volume into the frozen selected data object,

synchronizing the at least one ultimate remote volume into the penultimate remote volume by command of the second processing facility (HR), and

repeating, by default command, of a next mirroring cycle after completion of copy to the at least one second storage device, unless receiving command for mirroring break.

14. The method according to Claim 13, wherein mirroring further comprises:

selecting still another point in time occurring after completion of copy of the penultimate local auxiliary volume,

freezing the resulting source volume,

creating an ultimate local auxiliary volume in the local storage device and an ultimate remote volume in the at least one remote storage device,

forming an ultimate resulting source volume comprising the penultimate resulting source volume and the ultimate local auxiliary volume, and

copying the penultimate local auxiliary volume into the at least one ultimate remote volume,

redirecting to the ultimate local auxiliary volume of updates addressed to the selected data object,

permitting use of the selected data object during mirroring in associative operation with the ultimate resulting source volume,

synchronizing the penultimate local auxiliary volume into the selected data object,

synchronizing the at least one ultimate remote volume into the penultimate remote volume, and

repeating a next mirroring cycle by default command after completion of copy to the at least one second storage device, unless receiving command for mirroring break.

15. The method according to Claim 14, wherein mirroring further comprises:

storing in the at least one remote storage device of a complete mirrored copy of the selected data object comprising updates entered thereto at the time when copy of the before to penultimate local auxiliary volume was completed.

16. The method according to Claim 1, wherein:

mirroring is applicable to a data object selected from the group consisting of data volumes, virtual volumes, data files, system files, application programs, operation systems, data structures, and data base records.

17. The method according to Claim 1, wherein:

mirroring is applicable to a network connectivity selected from the group consisting of local area networks, wide area networks and storage area networks.

18. The method according to Claim 1, wherein mirroring further comprises:

repeating operation of the mirroring functionality at discrete repetition intervals of time defined as lasting at least as long as duration of copying of the ultimate local auxiliary volume to the ultimate remote volume.

19. The method according to Claim 1, wherein mirroring further comprises:

synchronizing updates to overwrite the selected data object, and

synchronizing a later remote volume to overwrite the penultimate resulting first remote volume.

20. The method according to Claim 1, wherein:

the selected data object comprises a contents span selected from the group of contents spans consisting of a part of the contents, the whole contents, and more than the contents of the local storage device.

21. The method according to Claim 1, wherein mirroring further comprises:

at the local storage device (SDL) at time t = 1:

setting a counter to s = 1 and creating a local auxiliary volume s,

freezing the selected data object and comprising the local auxiliary volume s and the selected data object into a resulting source volume s,

permitting use of the data object in association with the resulting source volume s, and

at the at least one remote storage device:

creating at time t of a remote volume s, at least equal in size to the data object, and starting from the time t:

copying the frozen data object from the resulting source volume s into the remote volume s until completion of copy,

whereby the data object frozen at time t is mirrored in the at least one remote storage device.

22. The method according to Claim 15, wherein mirroring further comprises:

at the local storage device at time t = t + 1 occurring after completion of copy to the at least one remote storage device:

a. increasing the counter to s = s + 1,

b. creating a local auxiliary volume s,

c. freezing the resulting source volume s– 1, and comprising the local auxiliary volume s and the resulting source volume s – 1 into a resulting virtual volume s, and

d. permitting use of the data object in association with the resulting local volume s, and

at the at least one remote storage device :

e. creating at time t of a remote volume s at least equal in size to the source volume, and

starting from the time t:

f. copying the local auxiliary volume s - 1 from the resulting source volume s into the remote volume s and completing copy,

g. operating the second processing facility for synchronization, by overwriting, of the remote volume s onto the remote volume s - 1, and

at the first storage device (SDL):

h. operating the first processing facility for synchronizing, by overwriting, of the remote volume s onto the local auxiliary volume s−1, and

repeating mirroring after completion of step f, by default repetition of the steps a to h, unless mirroring break is commanded.

23. The method according to Claim 22, wherein:

a volume is selected from the group consisting of volumes, virtual or logical volumes, and files.

24. The method according to Claim 22, further comprising:

storing in the at least one remote storage device at the time t of a complete mirrored copy of the selected data object comprising updates entered thereto at the time t – 2.

25. A system for mirroring a selected data object from at least one local storage device (SDL) into at least one remote storage device (SDRx), the at least one local storage device being coupled to a first processing facility (HL), and the at least one remote storage device being coupled to a second processing facility (HR), and where the at least one local storage device, the at least one remote storage device, the first and the second processing facility are coupled to a network connectivity comprising pluralities of users, of processing facilities and of storage devices, the system comprising:

a mirroring functionality running in the first and in the second processing facility, the mirroring functionality comprising:

a freeze procedure for freezing the selected data object,

a copy procedure for copying the frozen selected data object into the at least one remote storage device,

the selected data object being used and updated in parallel to running of the mirroring functionality, and

the mirroring functionality being run by default command, for copying updates to the selected data object, unless receiving command for mirroring break,

whereby the selected data object residing in the at least one local storage device is copied and sequentially updated into the at least one remote storage device.

26. The system according to Claim 25, wherein the mirroring functionality further comprises:

the freeze procedure being applied for freezing the selected data object as a source volume (SV),

at least one local auxiliary volume (AVL) to which updates addressed to the selected data object are redirected, each single data object out of the selected data object corresponding to one local auxiliary volume out of the at least one local auxiliary volume,

at least one remote volume being created in each remote storage device out of the at least one remote storage device, to correspond to each one local auxiliary volume created,

a resulting source volume being formed in the at least one local storage device to comprise the frozen selected data object and the at least one local auxiliary volume, and

the copy procedure being applied for copying the frozen selected data object from the resulting at least one resulting volume into the at least one remote storage device.

27. The system according to Claim 25, further comprising:

the mirroring functionality being applied simultaneously to more than one data object.

28. The system according to any one of Claims 25, 26 or 27, further comprising:

the mirroring functionality being configured to mirror simultaneously from at least one local storage device to at least one remote storage device, and vice-versa.

29. The system according to Claim 26, further comprising:

the freeze procedure being applied for freezing simultaneously more than one data object.

30. The system according to Claim 26, further comprising:

the copy procedure being applied to copy simultaneously more than one frozen selected data object.

31. The system according to Claim 25 or 26, wherein the mirroring functionality further comprises:

a configuration for simultaneous mirroring of one single data object residing in one local storage device into more than one remote storage device.

32. The system according to Claim 25 or 26, wherein the mirroring functionality further comprises:

a configuration for mirroring of more than one single data object simultaneously from one local storage device into one remote storage device.

33. The system according to Claim 25 or 26, wherein the mirroring functionality further comprises:

a configuration for mirroring simultaneously a plurality of single data objects residing respectively in a same plurality of local storage devices into one remote storage device.

34. The system according to Claim 25 or 26, wherein the mirroring functionality further comprises:

a configuration for mirroring simultaneously a plurality of single data objects residing in one local storage device respectively into a same plurality of remote storage devices.

35. The system according to Claim 25 or 26, wherein the mirroring functionality further comprises:

a configuration for mirroring simultaneously one single data object residing in each one local storage device out of a plurality of local storage devices into one remote storage device.

36. The system according to Claim 25, wherein mirroring further comprises:
at a selected point in time:

a mirroring cycle being started,

the selected data object being frozen,

at least one local auxiliary volume (AVL) being created in the at least one local storage device and at least one remote volume (RV) being created in the at least one remote storage device,

at least one resulting source volume being formed to comprise the frozen selected data object and the local auxiliary volume, and
after the selected point in time:

the frozen selected data object being copied from the resulting source volume into the at least one remote volume until completion of copy,

the updates addressed to the selected data object being redirected to the local auxiliary volume,

use of the selected data object being permitted during mirroring, by associative operation with the resulting source volume, and

a next mirroring cycle being repeated by default command, after completion of copy to the at least one remote storage device, unless receiving command for mirroring break.

37. The system according to Claim 36, wherein mirroring further comprises:

a next mirroring cycle starting at a next point in time occurring after completion of copy to the at least one remote storage device , and

the resulting source volume being frozen,

an ultimate local auxiliary volume being created in the local storage device and an ultimate remote volume being created in the at least one remote storage device,

an ultimate resulting source volume being formed to consist of the penultimate resulting source volume and of the ultimate local auxiliary volume , and

after the next point in time:

the penultimate local auxiliary volume being copied into the ultimate remote volume, and,

the updates addressed to the selected data object being redirected to the ultimate local auxiliary volume in the ultimate resulting source volume,

the selected data object being permitted for use during mirroring by associative operation with the ultimate resulting source volume and,

after completion of copy into the ultimate remote volume:

the penultimate local auxiliary volume being synchronized into the frozen selected data object,

the at least one ultimate remote volume being synchronized into the penultimate remote volume by command of the remote processing facility (HR), and

a next mirroring cycle being repeated, by default command after completion of copy to the at least one second storage device (SDR), unless a command for mirroring break is received.

38. The system according to Claim 37, wherein mirroring further comprises:

a still another point in time occurring after completion of copy of the penultimate auxiliary volume being selected,

the resulting source volume being frozen,

an ultimate local auxiliary volume being created in the local storage device and an ultimate remote volume being created in the at least one second storage device,

an ultimate resulting source volume being formed to comprise the penultimate resulting source volume and the ultimate local auxiliary volume, and

the penultimate local auxiliary volume being copied into the at least one ultimate remote volume,

the updates addressed to the selected data object being redirected to the ultimate local auxiliary volume in the ultimate resulting source volume,

the selected data object being permitted for use during mirroring in associative operation with the ultimate resulting source volume and,

the penultimate local auxiliary volume being synchronized into the selected data object,

the at least one ultimate remote volume being synchronized into the penultimate remote volume, and

a next mirroring cycle being repeated by default command after completion of copy to the at least one second storage device (SDR), unless a command for mirroring break is received.

39. The system according to Claim 38, wherein mirroring further comprises:

the at least one remote storage device storing a complete mirrored copy of the selected data object comprising updates entered thereto at the time when copy of the before to penultimate local auxiliary volume was completed.

40. The system according to Claim 25, further comprising:

the mirroring functionality being applicable to a data object selected from the group consisting of data volumes, virtual volumes, data files, system files, application programs, operation systems, data structures, and data base records.

41. The system according to Claim 25, further comprising:

the mirroring functionality being applicable to a network connectivity selected from the group consisting of local area networks, wide area networks and storage area networks.

42. The system according to Claim 25, further comprising:

the operation of the mirroring functionality being repeated at discrete repetition intervals of time defined as lasting at least as long as duration of copying of the ultimate local auxiliary volume to the ultimate remote volume.

43. The system according to Claim 25, further comprising:

the updates being synchronized to overwrite the selected data object, and

a later remote volume being synchronizing to overwrite the penultimate resulting first remote volume.

44. The system according to Claim 25, further comprising:

the selected data object comprising a contents span selected from the group of contents spans consisting of a part of the contents, the whole contents, and more than the contents of the local storage device.

45. The system according to Claim 25, further comprising:

at the local storage device (SDL) at time t = 1:

a mirroring cycle counter being set to s = 1 and a local auxiliary volume s being created,

the selected data object being frozen and comprising the local auxiliary volume s a resulting source volume s and the selected data object into a resulting source volume s,

the data object being permitted for use in association with the resulting source volume s, and

at the at least one remote storage device:

a remote volume s being created at time t, and being at least equal in size to the data object, and

starting from the time t:

the frozen data object being copied from the resulting source volume s into the remote volume s until completion of copy,

whereby the data object frozen at time t is mirrored in the at least one remote storage device.

46. The system according to Claim 45, further comprising:

at the local storage device at time t = t + 1 occurring after completion of copy to the at least one remote storage device:

a. the mirroring cycle counter being increased to s = s + 1,

b. a local auxiliary volume s being created,

c. the resulting source volume s – 1 being frozen, and comprising the local auxiliary volume s and the resulting source volume s – 1 into a resulting virtual volume s, and

d. the data object being permitted for use in association with the resulting local volume s, and

at the at least one remote storage device:

e. a remote volume s being created at time t with a size at least equal to the size of the source volume, and

starting from the time t:

f. the local auxiliary volume s - 1 being copied from the resulting source volume s into the remote volume s until copy completion,

g. the second processing facility being operated for synchronization, by overwriting, of the remote volume s onto the remote volume s - 1, and

at the first storage device (SDL):

h. the first processing facility being operated for synchronization, by overwriting, of the remote volume s onto the local auxiliary volume s –1, and

mirroring being repeated after completion of step f, by default repetition of the steps a to h, unless mirroring break is commanded.

47. The system according to Claim 46, further comprising:

a volume being selected from the group consisting of volumes, virtual or logical volumes, and files.

48. The system according to Claim 46, further comprising:

a complete mirrored copy of the selected data object comprising updates entered thereto at the time t – 2 being stored in the at least one remote storage device at time t.